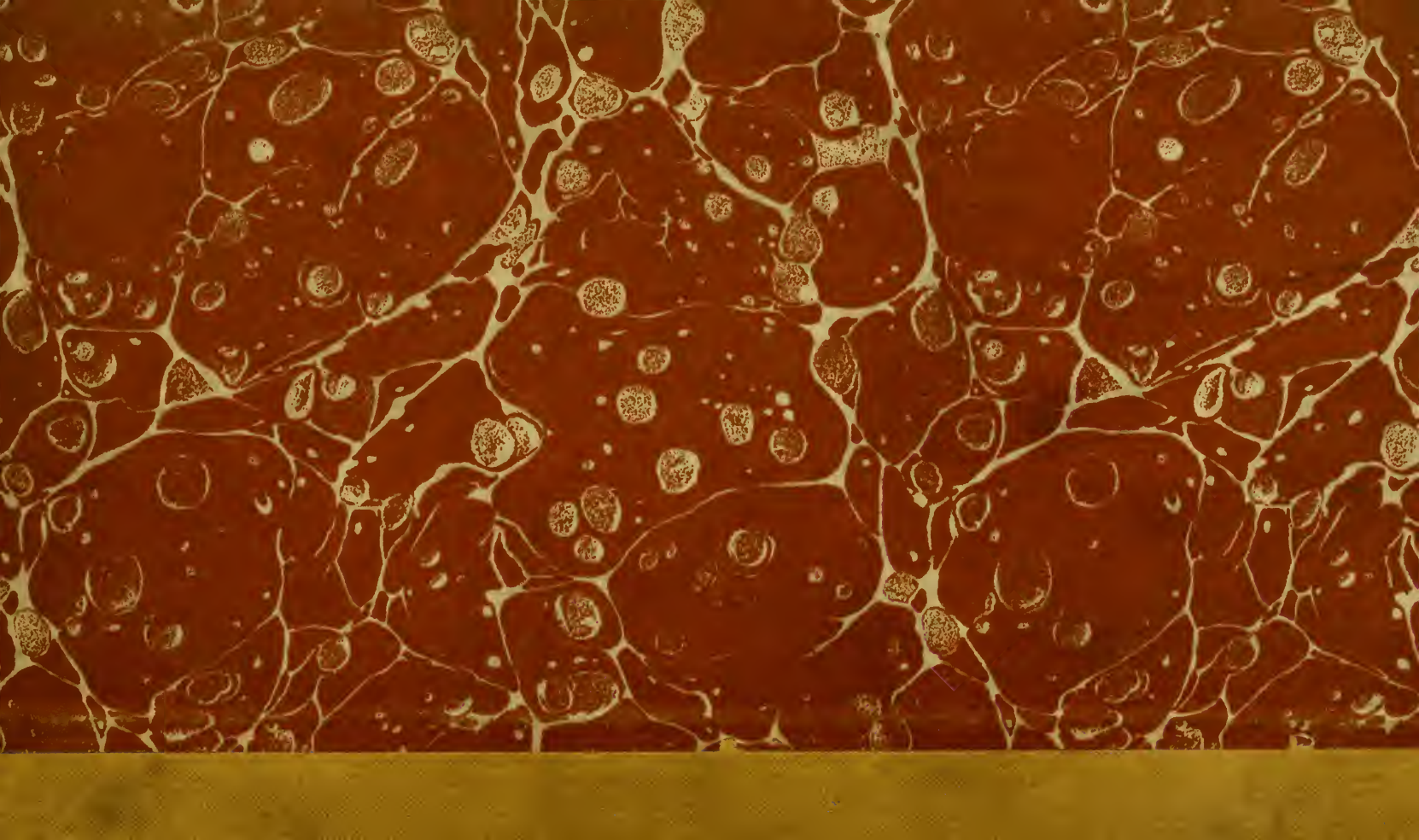

U. S. DEPARTMENT OF LABOR
JAMES J. DAVIS, Secretary
CHILDREN'S BUREAU
GRACE ABBOTT, Chief

WHAT IS MALNUTRITION?

By
LYDIA J. ROBERTS

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LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
CHILDREN'S BUREAU,
Washington, February 1, 1927.

SIR: There is transmitted herewith a revision of a bulletin, "What is Malnutrition?," which was published in 1919. Since then much material has been made available by research on the standards of height and weight for children of different ages and on other aspects of the problem of the nutrition of children. The bureau has revised its bulletin in the light of these later studies in an effort to assist persons responsible for the welfare of children—parents, teachers, social workers, and others—in recognizing and combating malnutrition.

Respectfully submitted.

GRACE ABBOTT, *Chief.*

Hon. JAMES J. DAVIS,
Secretary of Labor.

WHAT IS MALNUTRITION?

JUDGING THE NUTRITION OF CHILDREN

Malnutrition in children is widespread in the United States; in some communities it is so common that it is scarcely recognized as an abnormal condition. To combat malnutrition it is first necessary to recognize it—to distinguish between the well-nourished child and the malnourished one. It is, therefore, desirable to note the signs of good nutrition and of malnutrition.

SIGNS OF GOOD NUTRITION AND OF MALNUTRITION

What is malnutrition? Is it an infectious disease like measles or whooping cough, which runs its course and then is over? Unfortunately not; otherwise steps would have been taken long ago to control it. Nor is it a disease like gout or rheumatism which causes sufficient pain to demand attention and treatment. It is, in fact, not a disease at all, but, as Sir George Newman, chief medical officer of the board of education of England and Wales (27),[1] expresses it, "a low condition of health and body substance." "It is measurable," he says, "not only by height, weight, and robustness, but by many other signs and symptoms." A description of these "signs and symptoms" in the malnourished child will furnish a better idea of the meaning of malnutrition than any attempt at formal definition. The picture will be even clearer if its opposite—a healthy, well-nourished child—is described first.

A healthy, well-nourished child measures up to racial and family standards for his age in height and weight. He has good color, bright eyes—without blue circles or dark hollows under them, and smooth, glossy hair. His posture is good, his step elastic, his flesh firm, and his muscles well developed. He is usually happy and good-natured, and he is full of life and animal spirits. His sleep is sound, his appetite and digestion are good, and his bowels are regular. He is, in short, what nature meant him to be before anything else—a happy, healthy young animal.

A poorly nourished child lacks several of these characteristics of a well-nourished child—or all of them—depending on the degree of malnourishment. He is usually thin, but he may be fat and flabby. His skin may have a pale, delicate, waxlike look or it may be sallow, muddy, or even pasty or earthy. Usually blue circles or dark hollows are under his eyes, and the mucous membrane inside his eyelids is pale and colorless. His hair may be rough, like that of a poorly cared for farm animal, his tongue coated, and his bowels constipated.

[1] The figures in parentheses used throughout this report refer to corresponding figures in the list of references on pp. 17–19.

His skin seems loose, his flesh is flabby, and his muscles are undeveloped. Because of lack of muscular tone his shoulders are usually rounded, the shoulder blades sometimes standing out to such an extent as to produce the deformity known as "wings"; his chest is flat and narrow; his abdomen protrudes. His teeth may be decayed, and he may have enlarged or diseased tonsils and adenoids.

The animal spirits natural to all healthy young are likely to be lacking in the malnourished child; he may be listless at play and work, not caring to romp and play like other children; he is likely to tire easily; and he may be regarded as lazy. He is likely to lack mental vigor also—to have little power of concentration and attention—and to lack the natural inquisitiveness and mental alertness of a child. He may be nervous, restless, and fidgety; and he will probably sleep lightly and be finicky about his food.

Such then are some of the signs that distinguish a malnourished child from a well-nourished one. A malnourished child is an improperly nourished child. He may be undernourished, as is shown by deficiency in weight and height and by other symptoms, or he may be abnormally nourished, as is shown by overweight and other symptoms. Malnutrition exists in all degrees—from severe cases in which practically every symptom described in the foregoing paragraphs is present, to cases which, though they seem to lack definite symptoms, still give the general impression that the child is not quite normal in physical condition. The term malnutrition is usually applied only to cases showing a definite degree of undernutrition, especially those in which thinness of body and flabbiness of flesh and muscle are marked; it will be used in this sense throughout this report.

JUDGING NUTRITION BY PHYSICAL EXAMINATION (7) (44) (46)

The only sure way to decide whether a child is malnourished is to have him examined by a physician who takes into consideration all the signs that may point to malnutrition. According to one widely used system of grading nutrition by physicians' examinations, the Dunfermline scale, "the general appearance of the child, the condition of the skin and subcutaneous tissue, the muscular tone and development, the state of the mucous membranes, the vigor or listlessness which may appear in the child's facial expression, carriage, movements, voice, interest, attention—all contribute to our [the examining physicians'] decision." (7)

The Dunfermline scale, which was originated by Dr. Alister Mackenzie, of Dunfermline, Scotland, chief medical officer of the Carnegie Dunfermline Trust, divides children into four grades, as follows: 1, excellent (children of superior condition, such as the well-nourished child described on page 1); 2, good (children who fall just short of grade 1); 3, requiring supervision (children whose nutrition is on the border line of being seriously impaired); 4, requiring medical treatment (children whose nutrition is seriously impaired). Children in grades 3 and 4 are usually considered malnourished.

In spite of the definiteness of the grades in this scale its successful application depends largely on the individual examiner that uses it. All examiners can not be expected to agree in selecting children for the different grades. However, in a test application of the scale in New York City, in which nearly 300 children were graded by three

physicians in succession, it was found that the physicians agreed in judging the children with regard to nutrition as closely as they did in judging them with regard to defects of teeth or tonsils.

Errors may enter into the application of the scale. For example, in certain sections of New York City physicians had become so accustomed to undernutrition that they considered it a racial or a local characteristic, and as they found no children of the superior type that belonged in grade 1, they used the scale merely to show four degrees of undernutrition. To avoid such an error it would seem wise for health authorities to be sure that examiners are familiar with the superior type of child and that they understand that the scale is to be applied strictly according to the definitions.

Other scales are sometimes used: A three-grade scale—"good," "fair," and "poor"; and a five-grade scale—"excellent," "good," "fair,","poor," and "very poor." An advantage of the four-grade scale is that it definitely classifies every child examined either as needing attention or as not needing attention. There is no middle ground, as there is in three-grade or five-grade scales, by which the examiner may grade a child as "fair," without stating definitely whether or not the child needs attention. But it matters little what terms are used to describe the grades if the standards for each grade are well defined and if these standards are strictly adhered to. The advantage is evident of grading all children instead of disregarding all but the ones that are markedly underweight.

JUDGING NUTRITION BY HEIGHT AND WEIGHT STANDARDS

A thorough examination by a physician is not yet available to all children. The custom has arisen, therefore, during the past few years, of using increase in height and weight as a rough index of nutrition. Emerson (25), who was one of the first to call popular attention to the problem of malnutrition, regards the relation between a child's weight and his height as a reliable standard of nutrition. Most authorities (25) (29) (37) (3) agree that the age of the child should be considered in deciding what his normal weight should be for his height. The Baldwin-Wood-Woodbury table, which is generally regarded as the best available measuring stick for this purpose, gives the average height and the average weight for children at different ages (4). This table shows that the difference in weight for a given height is small during the earlier years of childhood but that during the adolescent years it is considerable, owing to the changes in the form and composition of the body that take place during adolescence. It is not claimed by the compilers of weight-height-age tables that every normal child is of the weight given in the table as the average weight for a child of his height and age. Some deviation from the average is expected and allowed for. Workers in this field have various opinions as to how far a child's measurements may deviate from the average without causing him to be placed outside the group considered normal. Whether or not he is considered definitely malnourished depends on the standard used by the examiner. Emerson holds that any child habitually 7 per cent or more underweight for his height is malnourished. Holt, Wood, and a large majority of other workers in this field consider 10 per cent a safer limit to use in routine examinations, and Clark (54) and others believe that instead

of setting up a fixed standard by which children of all ages are to be judged statisticians should make an effort to arrive at standards for different ages, as slight deviations from the standard are more significant in younger children than in older ones. Thus, for children of preschool age, of the early school years, and of the adolescent years, respectively, some such deviations as 7 per cent, 10 per cent, and 15 per cent might be allowed for. The next few years undoubtedly will see a movement in this direction.

But is weight for height and age alone an adequate index of nutrition? Are all children that are 10 per cent below the average weight for their height and age malnourished? And are all that are not so much as 10 per cent underweight well nourished? These questions are still debated. For a number of years the weight standard was universally employed as the standard by which the nutrition of children was judged. But as the work has progressed it has become apparent to critical observers of the results that this standard alone will not suffice.

Studies by Dublin and Gebhart (20), Clark (54), and the U. S. Children's Bureau (10) all reveal the inadequacy of this method. In the Dublin-Gebhart study the nutrition of 4,047 children of Italian parentage in New York City was judged in two ways; first by physicians who took into consideration a number of factors indicative of nutrition, and second by the weight-height-age standards. Comparison of the results of the two methods of judging showed that practically all the children that were as much as 10 per cent underweight by the weight-height-age standards were judged by the physicians to be malnourished. The weight method did not fail to select the most malnourished children, but it did not select all the children that the physicians considered malnourished, as three-fourths of the children considered by the physicians to be malnourished would have passed, by the weight-height-age standard, as well nourished. In the Clark study likewise nearly 10,000 native white children were examined by physicians for evidences of malnutrition and judged as to their nutrition by the weight-height-age standard. Comparison of the results of the two methods of judging showed that the selection of malnourished children by the weight-height-age standard agreed somewhat more closely with the physicians' selection in this study than in the Dublin-Gebhart study. However, about half the children selected by the physicians as malnourished would have been considered well nourished if the weight standard only had been employed. The results of other studies, as well as the observations of nutritionists in their daily work with children confirm these findings, and the tendency of modern work in judging the nutrition of children is away from the exclusive use of the weight-height-age standard.

This does not mean that the weight of children is unimportant as a factor in judging their nutrition, but it does mean that weight must be supplemented by other factors. It is generally agreed that all children should be weighed at least once a month and that any continued failure to gain weight—at least, to gain the normal amount of weight in a year—should be considered abnormal. It is also widely agreed that the large majority of children underweight as much as 10 per cent (or, if age is considered, as much as the percentages allowed for their respective ages) can be regarded as malnourished. But some children not underweight to this extent may be malnourished. It

is desirable, therefore, that every child examined should be studied by the signs of good nutrition previously outlined and that his diet and method of living should be inquired into. All children that fail to measure up to a high standard in all these respects should be considered in need of attention, whatever their weight may be.

It is is a hopeful sign that emphasis is now put more and more on attaining the "optimum" development and nutritional conditions for children, rather than merely average conditions.

EXTENT OF MALNUTRITION

What is the extent of malnutrition? There is no method of knowing this for the country at large, but the results of typical investigations are available. One such study was made in March, 1918, by the bureau of child hygiene of the department of health, New York City. When 171,661 school children in one borough had been graded by the Dunfermline scale (see p. 2) the following results were obtained: Grade 1 (excellent), 17.3 per cent; grade 2 (good), 61.1 per cent; grade 3 (requiring supervision), 18.5 per cent; grade 4 (requiring medical treatment), 3.1 per cent. If these figures were applicable to the city children as a whole, and the bureau of child hygiene believed that they were, New York's 1,000,000 school children at that time would have been graded about as follows: Excellent, 173,000; good, 611,000; requiring supervision, 185,000; requiring medical treatment, 31,000.

The results of numerous studies made in different parts of the country since 1918 show similar and even more serious situations. In a Children's Bureau study in a rural county in Kentucky (13) 40 per cent of the children were classed by the physician as "poor," 35 per cent as "fair," 18 per cent as "good," and only 7 per cent as "excellent." From extensive observations of thousands of children in widely separated localities, Emerson (25) concludes that at least one-third of the children in the United States are malnourished. Other studies tend to confirm these findings.

Although the results of such studies are not entirely comparable, owing to the different methods of judging nutrition that have been employed, they doubtless do give a fair picture of the national situation. It is probably safe to conclude that from one-fourth to one-third of the children in the United States are definitely malnourished; and that the number of children of really superior nutrition is small. Fortunately there is an increasing tendency in recent years for nutrition workers to center their attention more and more on the task of bringing all children into the "superior" group, rather than to be concerned merely with the markedly malnourished children. This is unquestionably a move in the right direction.

CAUSES OF MALNUTRITION

What causes malnutrition? Why are so few children in the "excellent" group? And why are so many distinctly below par? Are a certain few predestined by inheritance to be physically fit and others doomed to be inferior?

There is no doubt that inheritance influences a child's development. A child may be born with tendencies to tuberculosis or other disease, or, as Davenport (19) (30) has shown recently, to slender-

ness or stoutness. But slenderness must not be confused with malnutrition. A child of slender stock may be well nourished, for he may eat the kind of food that will nourish adequately all parts of his body, and, even though he puts on fat with greater difficulty than a child of stout stock, he may have sufficient subcutaneous fat to cover his bones and muscles.

The case histories of a large number of malnourished children show that the majority of these children started life in normal physical condition. Given this start, they should have developed into healthy, well-nourished children. That they failed to do so indicates that something was wrong with their diet and mode of living.

Lack of any one of a number of conditions necessary for normal growth may be the cause of malnutrition. Only the most important causes will be given here.

SPECIFIC CAUSES

Improper diet.

A diet insufficient or unsuitable is generally conceded to be the most common cause of malnutrition. Food is the first requirement of a growing child (18). Every movement his body makes and every bit of work it does requires energy, and this energy must be furnished by food.

If the food supply is insufficient the body itself will be consumed to provide energy, and loss of weight will result. Therefore, the diet of a growing child should be generous in amount. If a child eats an insufficient breakfast, such as bread and coffee, he is practically sure to eat too little total food for that day, even though he may eat a good dinner and a good supper. If he indulges in sweets and highly seasoned foods, or eats irregularly between meals, or keeps late hours, or sleeps in a poorly ventilated room, or gets too little exercise, he will have a finicky appetite, and this will result in his taking too little food. Whenever the food eaten habitually by a child falls below his actual need, no matter for what reason, malnutrition follows.

Besides being adequate in amount, a child's diet must be adequate in kind if malnutrition is to be avoided. To be well nourished, a child must have every day some protein to help form his muscles, his blood, his heart, his lungs, his brain, and all other parts of his body. Certain proteins of animal origin, such as those in milk, eggs, and meat, are especially valuable for growth, and a large proportion of the protein in the child's diet should be furnished by these foods.

Another need of the child is minerals. He must have calcium and phosphorus to build sound bones and teeth, iron to make red blood, and other minerals for uses just as definite. Since milk is about the only food that is a liberal source of calcium and since vegetables, fruits, whole cereals, egg yolks, and milk are the main food sources of most of the other minerals, it is readily seen that malnutrition in a child may be caused by not feeding him a sufficient quantity of these foods.

In addition to proteins and minerals, a child's diet must contain some of the growth-regulating substances known as vitamins. One of these, vitamin A, is provided in liberal amounts by the fat of milk, by egg yolks, by glandular organs such as liver, and by the leaves of plants; another, vitamin B, by whole-grain cereals, vegetables, fruits, milk, and other natural foods; and a third, vitamin C, by succulent fruits and vegetables, such as oranges and tomatoes. Vitamin D

(the antirachitic vitamin) is provided by direct sunshine, by cod-liver oil, and to a less extent by egg yolk (42). There is little danger that an ordinary diet will be entirely lacking in vitamins unless it is made up of foods that have been purified too much. However, children that receive no leafy vegetables and practically no milk nor eggs may fail to grow normally because they receive an insufficient amount of vitamins, minerals, and adequate proteins, and the malnourished state of many children may be laid to the fact that they receive too little of these foods and of fruits and whole cereals.

Wrong food habits.

Parents can do much to prevent malnutrition in their children by providing a diet adequate in amount and quality. But to feed a child ideally parents must take into account also the suitability of the food, the hours of eating, and all other food habits, for indigestible foods and faulty habits of eating may help to cause malnutrition. If the child's body is unable to use the food eaten malnutrition is as certain to follow as if the foods were inadequate in amount. The child's digestive tract is not fully grown and should not be expected to deal with all foods suitable for an adult any more than his immature muscles should be expected to do the work of an adult. To avoid taxing the child's digestive system, parents should provide simple, well-cooked, easily digested foods; should exclude rich, highly seasoned, indigestible foods; should introduce new foods gradually; and should see that the child eats regular, unhurried meals and does not eat indiscriminately between meals.

Insufficient sleep.

Insufficient sleep is another cause of malnutrition. Experiments with malnourished children have shown that even after the diet has been regulated children do not gain properly unless their hours of sleep are sufficient and regular. Teachers and others dealing with large groups of children testify to the fact that children who should go to bed not later than 7 or 8 o'clock go to bed at 9, 10, 11, or even later. Continued shortage of sleep is a serious cause of malnutrition and general ill health in many children.

Chronic fatigue.

Chronic fatigue brought about by too strenuous or too long-continued physical activity in work, in play, or in school athletics, combined with too little sleep, may be the chief cause of malnutrition. Overexcitement, overstimulation, and too much energy put into school work or extracurricular activities may add to this general fatigue. With many children, in order to cure chronic fatigue and thus bring about an improvement in their nutrition, it is necessary to restrict physical activities, to reduce the school work, to see that they give up outside lessons and go to bed earlier, and even to provide extra rest periods during the day.

Lack of exercise.

On the other hand, too little outdoor play with its consequence of too little fresh air, exercise, and sunshine may be responsible for poor nutrition and poor physical development in many children.

Diseases and defects.

Enlarged or diseased tonsils or adenoids, decayed teeth, tuberculosis, and syphilis are also causes of malnutrition. Adenoids and

defective tonsils may act in two ways. If these tissues are enlarged they may obstruct the free passage of air to the lungs and may also make swallowing difficult, so that the child eats too little and consequently is malnourished. If these tissues are diseased the germs from the diseased areas find free access to the blood stream and are carried to distant parts of the body, where they have harmful effects. In addition, the bacterial toxins may circulate through the body, causing repression of growth and even destruction of body tissues. Many severe cases of malnourishment may be cured merely by removing these abnormal or diseased growths.

Bad teeth may affect a child's nutrition in two ways: 1, Painful or seriously impaired chewing surfaces may interfere with thorough mastication of food or with the child's desire to eat proper foods; 2, abscessed teeth, like abscessed tonsils, may become sources of infection and in the same way cause tissue destruction.

To avoid these conditions, teeth should be inspected regularly (every six months); and every cavity, however slight, should be filled promptly.

Probably the most active agent in tearing down the body is tuberculosis. It gradually destroys the parts of the body infected, and its toxins are so pernicious that only the strongest, most robust body can withstand them.

Many children with congenital syphilis show a marked degree of malnutrition. In some of these children malnutrition may be the outstanding symptom of the disease, and the malnutrition may persist until antisyphilitic treatment is given.

When these physical defects—enlarged or diseased tonsils or adenoids, decayed teeth, tuberculosis, or congenital syphilis—are present, they become even more important causes of malnutrition than improper feeding or sleeping habits. Even if a child eats plenty of wholesome food he can not gain weight, nor even hold his own, if his body is being torn down as fast as it can be built up. It will be seen later that some of these defects may be results as well as causes of malnutrition.

UNDERLYING CAUSES

Before nutrition workers attempt to correct malnutrition it is necessary for them to inquire not only into the specific causes of it but also into the underlying causes. Why are children improperly fed? Why do they have too little sleep? Why are bad teeth and tonsils not attended to? The answer seems to be that ignorance, lack of parental control, and poverty—singly or together—are the causes underlying these bad conditions.

Abundant evidence has been found that ignorance and lack of parental control are more important causes of malnutrition in children than poverty. Studies have shown that many children are improperly fed because their parents do not know what are the proper foods for children nor how to spend their money to get the best return in food values (12); because they do not know that children should have regular, unhurried meals—including especially a good breakfast; and because they do not know that the habit of drinking tea and coffee and the habit of eating indiscriminately between meals are worse for children than for adults. Besides, some parents that do know these things fail to put them into practice, allowing their chil-

dren to eat whatever they like and whenever they wish, to live under continual stimulation and excitement, and to choose their own time for going to bed (50). The problem of malnutrition in children will not be solved until parents have some fundamental instruction in physical care (15) (16), and in the essentials of child management and training (9). The new movement for parent education will be one means of effecting this.[2]

At the beginning of the nutrition movement practically all the blame for the prevalence of malnutrition was laid on poverty. Experience soon showed the importance of ignorance and lack of parental control as factors and a tendency arose to minimize the importance of poverty as a factor in malnutrition. The extent to which poverty causes malnutrition has not been determined, but it is undoubtedly true the many children would be better nourished if their parents had an income that would enable the family to have sufficient air and sunlight and an adequate diet.[3] An intelligent and well-trained housewife can come much nearer to providing an adequate diet for her family on a small income than an ignorant housewife with the same amount of money—the former may succeed where the latter fails—but the fact remains that however intelligently expended, there is a minimum income which is necessary for the purchase of the food required for an adequate diet. Poverty is sometimes the explanation of ignorance Better location, better houses, better and more varied foods, and opportunities for educational contacts require not only an intelligent appreciation of their value but an income adequate to obtain them.

EFFECTS OF MALNUTRITION

Why worry about malnourished children? Many of them manage to keep alive, to pass through school, and grow up to take their place in the world as men and women. Does it make any difference if they are undernourished now? It does, indeed, make a great difference. "Malnutrition," said Sir George Newman (27) after many years of observation of its effects, "is one of the gravest evils in its [the child's] physique. The malnourished child tends to become disabled and unemployable, incapable of resisting disease or withstanding its onset and process" (27). Its evil effects are shown in both the physical and the mental development of the child.

PHYSICAL EFFECTS

Stunted growth, anemia, nervous instability, and diminished energy have already been shown to be accompaniments of malnutrition. From the point of view of appearance and of the comfort of living these are important. A malnourished, irritable child is not only far from pleasing in appearance but is a constant drain on the life of his associates, and a lifeless, uninterested child is no joy to himself nor to any one else.

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[2] In a recent study of child life in cities and rural districts of Scotland by the Medical Research Council (29), the efficiency of the mother in caring for the children was the only factor that showed positive correlation with greater growth and better nutrition among the children.

[3] In England, during the World War, when mothers were away from home working and children were more or less neglected, the percentage of markedly undernourished children decreased instead of increasing. This decrease was attributed by English authorities to the high wages prevalent during the war, which made it possible for families to have better and more abundant food and more desirable living conditions.

Long-continued malnutrition with its accompanying diminished energy and lowered resistance to infection may leave a permanent imprint on a growing child. Evidence of this was shown at the time of the Boer War, when England was shocked to learn that three out of every five men who applied for army service were physically unfit for it. A commission appointed to inquire into the cause of this condition returned the verdict that malnutrition during childhood was one of the most serious causes. In the United States at the beginning of the World War practically the same situation was found. A very large number of applicants had to be rejected because of physical unfitness, and the consensus of medical opinion blamed malnutrition and remediable defects of infancy and early childhood as the chief factors responsible for this condition.

One of the most serious results of malnutrition is increased susceptibility to disease and lack of resistance to it. If an infectious disease such as measles, whooping cough, or scarlet fever attacks a neighborhood, the difference between the well-nourished and the malnourished child at once appears. The child in good physical condition may not escape the disease; but if he contracts it, he has more vigor to withstand the attack, and his recovery is usually rapid. On the other hand, if the malnourished child contracts the disease, especially if he has bad teeth, or diseased tonsils, or adenoids, he probably has a more serious case; and if he recovers, he does so with greater difficulty. A large proportion of mortality among children is due directly or indirectly to faulty nutrition. Scarlet fever, diphtheria, measles, pneumonia, tuberculosis, and intestinal diseases claim most of their victims from those who are too poorly nourished to resist them.

The relation between malnutrition and tuberculosis needs special emphasis. Tuberculosis may be an active cause of malnutrition, and a malnourished body is the best soil for tuberculosis. Malnutrition makes the child susceptible to tuberculosis, which, once started, tears down the body and increases the degree of malnutrition. This makes the progress of the disease still easier, and thus the process continues until death. The way to withstand tuberculosis is to build strong and well-nourished bodies by good food, fresh air, rest, and sunshine. Then the disease can make no headway.

The chances for cure in organic diseases of childhood are also dependent on the child's nutrition to a greater degree than has been generally recognized. Holt has shown that lesions even of the heart, or the kidneys, or other vital organs, which under adverse conditions of nutrition usually terminate fatally, may be outgrown provided good nutrition is built up and maintained constantly (38).

Are the effects of malnutrition permanent, or may they be eradicated completely in adult life? The results of experimentation on animals, as well as observations on human beings, indicate that if malnutrition has not been too severe nor too long continued its effects may be overcome almost entirely when the nutritional state is restored to normal (48). The sooner malnutrition is recognized and corrected, therefore, the greater are the chances for the child's complete recovery. The effects of long-continued or severe malnutrition may never be overcome completely.

If parents are impressed with these facts and if they are taught to regard malnutrition as an abnormal condition likely to result in serious

illness and possibly in death, they may be persuaded more easily to put forth greater efforts to bring their children into a state of good nutrition.

MENTAL EFFECTS

The effects of malnutrition on mental work have long been recognized. Early school-feeding experiments both in England and in the United States showed that improvement in the nutrition of children practically always resulted in improvement in their school work (5). The teachers testified that after the children's nutrition had been improved they were easier to teach, showed better power of concentration and attention, and obtained better ratings in school work than they did in the undernourished condition. This is not difficult to understand, for a starved brain can not be expected to work efficiently any more than any other part of a starved body.

Studies of the weights and heights of school children also suggest a relationship between physical and mental development. Many studies showing the degree of correlation between the growth of school children and their mental advancement as shown by progress in school, intelligence tests, and class standing indicate that in general the best-developed children physically are the farthest advanced mentally. This correlation is not always evident, however, when individuals or small groups are studied; malnourished children are not always dull and backward in their school work, and mentally retarded children can not always be made to do good school work merely by improving their nutrition. The native mental endowment is the greatest determining factor. Although any child's mental powers are lowered by extreme malnutrition, a highly endowed child has a sufficient margin to enable him to do creditable school work and to pass well in mental tests, when tested for short periods of time. Such a child even though malnourished and below his own maximum will still be superior mentally to a better-nourished child of inferior mentality. With a child of average intelligence malnutrition may be a sufficiently important factor to put him into the mentally retarded group. Although comparisons can not be made between individuals it is safe to conclude that a child does the best mental work of which he is capable only when he is at his "optimum" state of nutrition and physical well-being. It is true also, as Baldwin has asserted many times, that when large numbers of children are considered, the physically superior children are also mentally superior.

It is, then, imperative from the point of view of the mental as well as the physical welfare of the race that every effort should be made to make and keep the rising generation well nourished.

TREATMENT OF MALNUTRITION

The first step in treating malnutrition is to find the cause or causes. This requires a careful inquiry into the child's method of living, as well as a thorough physical examination. When the causes have been discovered the next step, obviously, is to remove them. With some children this is a comparatively simple matter, but with others the whole program of life needs to be overhauled. Tonsils and adenoids may need to be taken out, bad teeth cared for, the diet regulated, and a new scheme of living instituted. It may be necessary for the

nutritionist to urge the child's parents to exercise a wiser, firmer control of his way of living and to teach them the meaning of healthful living and adequate food. To do this requires putting into practice a program of health education and sometimes even the provision of opportunities for obtaining proper food and other factors of normal living. If poverty is the cause of the child's having insufficient food the help of relief agencies must be enlisted. Some of the agencies that have been established to meet these needs are discussed in the following sections.

SCHOOL LUNCHES (6)

"School lunches" (that is, extra meals provided by school authorities) were established in England almost immediately following the discovery in 1900 of the extent of malnutrition in that country, and they have since been extensively used there. This extra meal is sometimes a breakfast, sometimes a mid-morning lunch, and sometimes only a cup of milk. The school lunch ministers largely, though not entirely, to the children of the poor, and its use is based on the belief that insufficient food is the chief cause of poor nutrition. The results of school feeding in England have been so beneficial to the children that the extra meal as a specific measure for dealing with malnutrition has become firmly established.

In America the school lunch began, as in England, with supplementary school feeding of children in the poorer sections of cities. New York, Philadelphia, Chicago, and other cities early started lunches of this kind to provide extra nourishment for children who came to school without breakfast, or who were otherwise underfed, largely because of poverty. As nutrition work has developed, extra meals have been provided in many cities for undernourished children in all stations in life. This is in accord with the belief of Emerson and others that an undernourished child gains better on five small meals than on three larger ones. Not all nutritionists, however, agree that this is necessarily true, and many prefer to keep the children to three regular meals unless it is demonstrated in individual cases that the extra feedings are conducive to better results.

The type of school lunch which has developed most rapidly in this country is the hot midday lunch for children who live too far from school to go home at noon or who for other reasons would not have an adequate lunch unless the school provided it. These lunches, which are paid for by the children, have been introduced widely during the last decade or more, and special impetus has been given to the movement for supplying a hot noon meal for children in rural schools.

It is obvious that such lunches afford rich opportunities for the nutritional betterment of children (21). Through this one meal eaten together by the children day after day, the school not only can insure that one of the day's meals is what it should be but through a proper use of its opportunities for education can do much in training children in the formation of right food habits, in the cultivation of a liking for wholesome foods, and in wise selection of food. The failure of the usual school lunch lies in the lack of educational supervision. Even though good food is provided the children choose their lunches unsupervised and thus too often have lunches inadequate in amount and unsuitable in kind. Fortunately many schools are recognizing the need for trained nutrition supervisors to plan the meals

and to train and guide the children in the choice of food. Thus used, the school lunch becomes one of the most effective means for health education, and there is need that it should be employed far more generally.

NUTRITION CLINICS AND CLASSES

One of the most effective methods of dealing with undernutrition is the nutrition clinic or class. Doctor Emerson as long ago as 1910 conducted such classes in Boston (24) (26). Dr. Charles Hendee Smith started a nutrition clinic at Bellevue Hospital in New York City in 1916 (52), and in the four or five years following this their spread was rapid (53) (41) (55) (45) (47) (50). The method of conducting a dispensary nutrition clinic is as follows:

Underweight children are examined by a physician to discover their needs, and then groups of these children meet weekly to be weighed and to be given instruction in food values and in general hygiene. A weight chart is kept for each child, and the children compete to see which can gain most or be first to reach the normal rate of increase in weight. Any physical defects, such as diseased tonsils or adenoids, are always corrected first, as no gain can be expected until these defects are removed. Visits to the homes to study home conditions and to engage the interest of the parents in carrying out the classroom instructions are a necessary part of the work. Mothers are urged to come to the class, but the instruction is given primarily to the children. The cooperation of the child is, in fact, the biggest factor in the success of the class. Once a child becomes interested in his own improvement, he will drink milk, eat vegetables and oatmeal, go to bed earlier, open his windows, and take the necessary rest periods—things his parents may have been almost powerless to get him to do.

The repeated health instructions, together with the weekly checking up and the spirit of class competition, combine to produce excellent results.

The work that began in dispensaries spread rapidly. Soon nutrition classes were conducted in settlements in day nurseries, in schools—any place where children were gathered together. It was early recognized by all workers in this field that the school is the logical place for the educational phases of nutrition work for children of school age. Here all such children can be reached, regularity of attendance can be obtained, and the educational facilities of the school—the medical service, the hygiene classes, the physical-training exercises, the home-economics department, and the school lunch, as well as the general school activities—all can be utilized to insure that the children learn hygienic living, and, during the school day at least, practice it.

The first efforts to put a nutrition program into the school took the form of nutrition classes for underweight children conducted by the regular clinical methods that had been developed in the dispensaries. In 1918 Doctor Emerson assisted the Bureau of Educational Experiments in starting nutrition classes in a public school in New York City (26) (40), and since then he has been instrumental in developing this type of work in the schools of numerous cities throughout the country. Other individuals and organizations have also begun similar work in schools.

HEALTH EDUCATION FOR ALL SCHOOL CHILDREN

As the work has progressed the emphasis has been shifting more and more from the mere remedial aspects to the preventive ones. Instead of being limited entirely to classes for the most underweight children—as it was in the beginning—the work is rapidly developing into an all-round health-education program for every school child. In many schools all children—not merely the underweight ones—are weighed at least monthly, and medical examinations are given to as many as possible. Instruction concerning diet, sleep, exercise, and other matters of hygiene is given in all grades, and the work is correlated with the regular school subjects and activities (31-36). Teachers now put emphasis on the practice of healthy living instead of following the old method of formal instruction without any application to the children's own lives.

In some schools, in addition to the regular health-education program, special classes are still conducted for the most undernourished children. In others, additional attention is given to such children by special measures—such as extra rest periods or relief from some of the school strains. In most schools nutrition work no longer stands out as a separate unit, but it has been incorporated into the health-education program and the whole fabric of school life. Not all schools, by any means, have as yet any type of nutrition or health-education work; but the opinion of leaders appears to be that the study of nutrition is gradually becoming a part of the regular health-education program in schools.

Introduction of nutrition work into a school system calls for trained direction. In the elementary grades most of the health instruction is given by the classroom teachers. For this work they should have more training in hygiene and nutrition than the usual teacher has. At least one specialist in nutrition should be employed to plan and direct the teaching and to develop the educational supervision of the school lunch. Home-economics teachers may develop into such specialists if they have the time and the training required, or extra nutritionists may be employed. A nutritionist who has adequate preparation in other phases of health education may become also the health-education director for the entire school. All-round development of this program requires the services of a physician and, for follow-up work, of a school nurse (22).

NUTRITION WORK FOR PRESCHOOL CHILDREN

It is during the preschool years that malnutrition usually starts, and yet activities for its prevention and correction in these years have been much slower in developing than for the years of infancy and school attendance. The Children's Year campaign,[4] however, was instrumental in directing the public's attention to this "neglected age." As part of this campaign, hundreds of thousands of children were weighed and measured by physicians. The most important results of this work were the widespread realization of the needs of infants and preschool children and the rapid development of welfare

[4] The Children's Year campaign was an effort to protect children from the effects of war, made by the U. S. Children's Bureau and the child conservation section of the field division of the Council of National Defense, in cooperation. It was carried on during 1918, the second year of the participation of the United States in the World War. In this campaign a program of child welfare was set forth, including public protection of maternity and infancy, mother's care for older children, enforcement of all child labor laws and full schooling for all children of school age, and recreation.

work for these two groups of children by State and local public-health agencies and by private organizations.

With the passage of the Sheppard-Towner Act November 23, 1921, Federal aid was made available to the several States for developing their work in the hygiene of maternity and infancy.[5] Forty-three States and the Territory of Hawaii have now accepted the terms of the act and are doing some type of hygiene work for mothers and infants. In addition to carrying on the program for prospective mothers, all these States are working toward the establishment of health centers for all children. Through these measures nutritional care has been made available in many localities where it was formerly lacking, especially in rural districts.

In the past a large part of the work of most health agencies has been done for infants rather than for children 2 to 6 years old. However, the importance of careful supervision of the physical condition of these older children has been demonstrated, and the number of children 2 to 6 years old cared for by health agencies is steadily increasing. Standards for conducting conferences in child-health centers and methods of organizing and conducting nutrition work in these centers have been presented in other Children's Bureau publications (14) (17).

Other agencies besides the child-health center are contributing to improvement in the nutrition of preschool children as well as older children: Habit clinics, nursery schools, home demonstration work, and the various aspects of the new movement for parent education. Habit clinics were originated for the purpose of attacking mental problems of childhood, including those of management and training. The methods and successes of such clinics have been described by Dr. D. A. Thom in a study of their organization and value (11). Since the problem of correcting malnutrition is largely one of developing wise parental control, the habit clinic, which attacks difficulties of sleep, diet, and other physical habits from the point of view of child management, is usually of great service in promoting the proper nutrition of the child.

The nursery school likewise has proved to be a valuable health agency to the children that it reaches. The children actually live several hours of every day in the nursery school, and it thus becomes possible for the school to see that these hours, at least, are lived properly. The outdoor play, the daytime nap, and the noon meal can be supervised, and training in right habit formation can be directed by specialists in child management. In addition to these, the weighing and measuring and the medical supervision of the children, and the training the parents receive either directly or indirectly from their association with the school, are all conducive to the physical betterment of the children. The home demonstration work carried on by the United States Department of Agriculture in cooperation with State colleges of agriculture is also helping to raise the standard of nutrition in rural districts (1). The American Red Cross through its nutrition service has developed nutrition work in many rural communities (2).

The new movement for parent education, which is now receiving popular recognition, also promises good results. Clubs of mothers—

[5] This act is administered by the U. S. Children's Bureau.

and in the more progressive communities of fathers as well—are being organized in ever-increasing numbers throughout the country for the study of the problems of childhood. With a better understanding of the requirements for the all-round development of children and of the newer methods of child training improvement in the nutrition of children and in the whole quality of child life can not fail to follow.

CONCLUSION

Unfortunately not all these agencies have as yet been made available to the large mass of children. Many children do not receive the advantages of such attention until they reach the preschool age, many not until they enter school, and many not at all. Although nutrition work in the country at large is progressing rapidly and in the right directions it can not be considered adequate until it reaches a higher percentage of children than at the present time and until it covers every period of the child's life. When all mothers have adequate prenatal care; when all children have proper supervision up to the age of 6 years by child-welfare agencies or by private physicians; when all schools, through proper medical attention, health instruction, school lunches, and healthful schoolroom conditions, insure suitable nutritional and health care for every school child; when all parents have some fundamental training in the care, feeding, and management of children; then the ideal—continuous conditions favorable to normal nutrition and growth for all children from conception throughout the growing period—will come near being realized. Not till then can we hope to solve the problem of the malnourished child and thus to grow a healthy, well-nourished generation.

LIST OF REFERENCES

1. **Agriculture, United States Department of:** Extension Work in Foods and Nutrition, 1923, by Miriam Birdseye. Department Circular 349. Washington, July, 1923. 31 pp.
2. **American National Red Cross:** The Organization of a Nutrition Service. Bulletin No. 724. Washington, 1924. 20 pp.
3. **Baldwin, Bird T.:** The Use and Abuse of Weight-Height-Age Tables as Indexes of Health and Nutrition. Journal of the American Medical Association, vol. 82, no. 1 (January 5, 1924), pp. 1–4.
   ——— Physical Growth and School Progress. *See* Education, Bureau of.
4. ——— **T. D. Wood, M. D., and Robert M. Woodbury:** Weight-Height-Age Tables. American Child Health Association, Washington, 1923. 10 pp.
5. **Blanton, Smiley, M. D.** "Mental and nervous changes in the children of the Volksschulen of Trier, Germany, caused by malnutrition." Mental Hygiene, vol. 3, no. 3 (July, 1919), pp. 343–386.
6. **Bryant, Louise Stevens:** School Feeding. J. B. Lippincott Co., Philadelphia, 1913. 345 pp.
7. **Carnegie Dunfermline Trust:** Eighth Annual Report on the Medical Inspection of School Children in Dunfermline [Scotland], 1912–13, by Alister Mackenzie, M. D.
8. **Chicago Public Schools:** Report of the Department of Child-Study and Pedagogic Investigation (Child-Study Report No. 3), pp. 38–63. Chicago, 1902.
9. **Children's Bureau, United States Department of Labor:** Child Management, by D. A. Thom, M. D. Publication No. 143. Washington, 1925. 36 pp.
10. ——— Children of Preschool Age in Gary, Ind., pp. 101–112. Publication No. 122. Washington, 1925.
11. ——— Habit Clinics for the Child of Preschool Age, by D. A. Thom, M. D. Publication No. 135. Washington, 1924. 71 pp.
12. ——— Milk, the Indispensable Food for Children, by Dorothy Reed Mendenhall, M. D. Publication No. 163. Washington, 1926. 43 pp.
13. ——— The Nutrition and Care of Children in a Mountain County of Kentucky, by Lydia Roberts, pp. 7–8. Publication No. 110. Washington, 1922.
14. ——— Nutrition Work for Preschool Children, by Agnes K. Hanna. Publication No. 138. Washington, 1924. 25 pp.
15. ——— Posture Clinics, by Armin Klein, M. D. Publication No. 164. Washington, 1926. 32 pp.
16. ——— Posture Exercises, by Armin Klein, M. D., and Leah C. Thomas. Publication No. 165. Washington, 1926.
17. ——— Standards for Physicians Conducting Conferences in Child-Health Centers. Publication No. 154. Washington, 1926. 11 pp.
18. ——— What Builds Babies? Folder No. 4. Washington, 1925. 8 pp.
19. **Davenport, C. B.:** Body Build, Its Development and Inheritance. Eugenics Record Office Bulletin No. 24 (Abstract of Publication No. 329, Carnegie Institution of Washington). Cold Spring Harbor, N. Y., 1925. 42 pp. (*See also* no. 30.)
20. **Dublin, Louis I., and John C. Gebhart:** "Do height and weight tables identify undernourished children?" American Journal of Public Health, vol. 13, no. 11 (November, 1923), pp. 920–927. Reprint issued by the New York Association for Improving the Condition of the Poor.

21. **Education, Bureau of, United States Department of the Interior:** The Child Health School, by Lydia J. Roberts. School Health Studies No. 2. Washington, 1923. 60 pp.
22. ——— Health for School Children. Report of the Advisory Committee on Health Education of the National Health Council. School Health Studies No. 1. Washington, 1923. 75 pp.
23. ——— Physical Growth and School Progress, by Bird Thomas Baldwin. Bulletin, 1914, No. 10. Washington, 1914. 215 pp.
24. **Emerson, William R. P., M. D.:** "Food habits of delicate children." New York Medical Journal, vol. 105, No. 8 (February 24, 1917), pp. 361–394.
25. ——— Nutrition and Growth in Children. D. Appleton & Co., New York, 1922. 342 pp.
26. ——— "A nutrition clinic in a public school." American Journal of Diseases of Children, vol. 17, no. 4 (April, 1919), pp. 251–263.
27. **[Great Britain] Board of Education:** Annual Report for 1915 of the Chief Medical Officer, p. 32. London, 1916.
28. ——— Annual report for 1917 of the Chief Medical Officer, pp. 130–135. London, 1918.
29. **[Great Britain] Privy Council:** Child Life Investigatons—Poverty, Nutrition and Growth. London, 1926. 333 pp.
30. "Heredity and obesity." Editorial, Journal of the American Medical Association, vol. 82, no. 6 (February 9, 1924), pp. 470–471. (*See also* no. 19.)
31.[1] **Hoefer, Carolyn:** "Increasing the efficiency of health instruction in the public schools." Elementary School Journal, vol. 22, No. 1 (September, 1921), pp. 31–43.
32. ——— "Methods of health instruction in the second and third grades." Ibid., no. 3 (November, 1921), pp. 212–222.
33. ——— "Methods of health instruction in the fourth and fifth grades." Ibid., no. 5 (January, 1922,) pp. 361–371.
34. ——— "Methods of health instruction in the sixth grade." Ibid., no. 7 (March, 1922), pp. 696–707.
35. ——— "Methods of health instruction in the seventh grade." Ibid., no. 9 (May, 1922), pp. 696–707.
36. ——— "Health program in the public schools of Joliet, Ill." Ibid., no. 10 (June, 1922), pp. 764–765.
37. **Holt, L. Emmett, M. D.:** Food, Health, and Growth. Macmillan Co., New York, 1922. 273 pp.
38. ——— "Growth as a factor in prognosis." Journal of the American Medical Association, vol. 82, no. 17 (April 26, 1924), pp. 1333–1337.
39. ——— "Standards for growth and nutrition." American Journal of Diseases of Children, vol. 16, no. 6 (December, 1918), pp. 359–375.
40. **Hunt, Jean Lee, Buford J. Johnson,** and **Edith M. Lincoln:** Health Education and the Nutrition Class. E. P. Dutton & Co., New York, 1921. 281 pp.
41. **Kantor, John L., M. D.:** "Experience with a class in nutrition." New York Medical Journal, vol. 108, no. 6 (August 10, 1918), pp. 241–243.
42. **McCollum, E. V.,** and **Nina Simmonds:** Food, Nutrition and Health. Published by the authors, Baltimore, 1925. 143 pp.
43. "Malnutrition among school children." Weekly Bulletin of the Department of Health, City of New York, new ser., vol. 7, no. 10 (March 9, 1918), pp. 75–77.
44. **Manny, Frank A.:** "A comparison of three methods of determining defective nutrition." Archives of Pediatrics, vol. 35, no. 2 (February, 1918), pp. 88–94.
45. ——— "Nutrition clinics and classes." Modern Hospital, vol. 10, no. 2 (February, 1918), pp. 129–132.
46. ——— "A scale for marking malnutrition." School and Society, vol. 3, no. 56 (Jan. 22, 1916), pp. 123–124.
47. **Mitchell, David, M. D.:** "Malnutrition and health education." Pedagogical Seminary, vol. 26, no. 1 (March, 1919), pp. 1–26.

[1] Reprints of nos. 31–36 may be obtained from the Elizabeth McCormick Memorial Fund, Chicago, Ill.

48. **Morgulis, Sergius:** "Inanition." Fasting and Undernutrition (E. P. Dutton & Co., New York, 1923), pp. 289–308.
49. **Porter, W. Townsend:** "The physical basis of precocity and dullness." Transactions of the Academy of Science of St. Louis, vol. 6, (1892–94), pp. 161–181. St Louis, 1895.
50. **Roberts, Lydia:** "A malnutrition clinic as a university problem in applied dietaries." Journal of Home Economics, vol. 11, no. 3 (March, 1919), pp. 95–101.
51. ——— Nutrition Work with Children. University of Chicago Press, 1927. 394 pp.
——— The Child Health School. *See* Education, Bureau of.
——— The Nutrition and Care of Children in a Mountain County of Kentucky. *See* Children's Bureau.
52. **Smith, Charles Hendee, M. D.:** "Methods used in a class for undernourished children." American Journal of Diseases of Children, vol. 15, no. 6 (June, 1918), pp. 373–396.
53. ——— The Nutrition Class. Child Health Organization of America, New York, 1921. 46 pp.
54. **U. S. Public Health Service, United States Treasury Department:** Weight and Height as an Index of Nutrition, by Taliaferro Clark, M. D., Edgar Sydenstricker, and Selwyn D. Collins. Reprint No. 809. Washington, 1924. 20 pp.
55. **Wilson, May G., M. D.:** "Report of the Cornell nutrition class." Archives of Pediatrics, vol. 36, no. 1 (January, 1919), pp. 37–44.

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